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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/563,924	01/09/2006	Ingrid Annemarie Rink	NL 031292	3800

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EXAMINER	
VINH, LAN	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
10/17/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ip.department.us@nxp.com

Office Action Summary	Application No.	Applicant(s)	
	10/563,924	RINK ET AL.	
	Examiner	Art Unit	
	LAN VINH	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 5, 7-15* is/are rejected.

7)☒ Claim(s) *4 and 6* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 7/10/2008 have been fully considered but they are not persuasive.

The applicants argue that the Chiu reference fails to disclose water-based sulfuric acid solution and using dilute sulfuric acid solutions because Chiu discloses concentrated mixtures whose major component is sulfuric acid (see, e.g., Col. 7:15-17). This argument is unpersuasive for the following reasons: according to the Merriam-Webster on line, "dilute" is defines as "to make thinner or more liquid by admizture", thus Chiu teaching of the cleaning mixture comprises sulfuric and hydrogen peroxide" reads on dilute sulfuric acid solution; Chiu teaching of " mixture is seven part sulfuric acid to three part of 30% hydrogen peroxide" is understood that hydrogen peroxide is diluted with water, furthermore, concentrated sulfuric acid is known to contain water (see pertinent prior art of record for evidence of this basis). Thus, it is maintained that Chiu discloses water-based sulfuric acid solution/dilute sulfuric acid solutions

The applicants argue that Verhaverbeke does not appear to disclose a mixing unit that mixes sulfuric acid from a reservoir and demineralized water to produce a cleaning agent, as claimed. This argument is unpersuasive because Verhaverbeke discloses "during use, cleaning chemicals and rinsing water such as DI water are fed through a nozzle 214 to generate spray 220 (col 5, lines 62-66) and Verhaverbeke also discloses that cleaning chemical, in one embodiment, comprises a mixture of sulfuric and hydrogen peroxide (col 9, lines 5-10), the cleaning chemical is mixed with DI water at

conduit 226/mixing unit (fig. 2A). Thus, the rejection of claims 14-15 under 35 U.S.C 102(e) based on Verhaverbeke is maintained

The applicants argue that that there is no suggestion to combine the references of Chiu and Basi to reject claim 3 because the applicants find nothing in the reference of Basi to suggest the disclosed cleaning steps would be suitable for cleaning an etched substrate that includes an active device. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since both references of Chiu and Basi have the same field of endeavor (semiconductor processing) and the motivation to combine comes from Basi, one skilled in the art at the time the invention was made would have found it obvious to employ Basi cleaning solution in Chiu method to produce the claimed invention

It is argued that one of skill in the art would not have modified Chui to use the 20 to 30° C. temperature range disclosed by Basi because Chiu teaches away from the proposed combination by explicitly teaches using temperatures in the range of 100 to 150° C. This argument has been fully considered and are persuasive. The rejection of claim 6 under 35 U.S.C 103(a) based on Chiu and Basi has been withdrawn.

The applicants argue that that there is no suggestion to combine the references of Chiu and Uzoh because the applicants submits that one of skill in the art would not

reasonably expect that the disclosed cleaning steps , as taught by Uzoh,would be suitable for cleaning an etched substrate that includes an active device. In response, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since both references of Chiu and Uzoh have the same field of endeavor (semiconductor processing) and the motivation to combine comes from Uzoh, one skilled in the art at the time the invention was made would have found it obvious to employ Uzoh teaching in Chiu cleaning solution to produce the claimed invention

In response to applicant's arguments against the reference of Mohindra individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Chiu et al (US 7,078,351)

Chiu discloses a process for patterning a photoresist on a semiconductor device with a substrate 10 and a semiconductor body which comprises at least one active semiconductor element (col 4, lines 60-65) wherein, after the semiconductor element has been formed, a layered structure is provided comprising at least one electrically insulating layer 16, wherein an opening 19 is formed in the layered structure by means of a patterned photoresist layer (18) and an etch process (col 7, lines 5-10), wherein residues are formed at the surface of the semiconductor body during the etch process, wherein the photoresist layer is ashed, after the etch process, by means of a treatment with an oxygen-containing compound (col 7, lines 25-30), after which the surface of the semiconductor body is cleaned using a cleaning agent containing a diluted solution of an aqueous acid/acid in water and being heated to a temperature above the room temperature for 5-10 minutes, as a result of which the residues formed are removed from the surface, characterized in that sulphuric acid is chosen for the acid in the cleaning agent (col 7, lines 15-20)

3. Claims 14-15 are rejected under 35 U.S.C. 102(e) as being anticipated by Verhaverbeke et al (US 7,159,599)

It is noted that claims 14-15 drawn to an apparatus and the recitation of" for use in a method claimed in claim 1" and " is arranged for mixing of sulphuric acid between 0.01 and 10% by weight, and preferably between 0.5 and 5% by weight with demineralized water" are considered as intended use/functional language of the claimed apparatus that do not have patentable weight in these apparatus claims. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844,847, 120 USPQ 528,531 (CCPA 1959). Also, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987

Regarding claim 14, Verhaverbeke discloses an apparatus for processing wafer comprises:

a reservoir 224 with concentrated sulphuric acid (col 9, lines 5-10; fig. 2A)

a supply of DI/demineralized water (fig. 2A)

a mixing unit 226 for mixing sulphuric acid provided by the reservoir and demineralized water provided by the supply thereby obtaining the cleaning agent (col 6, lines 1-5)

a cleaning station 200 for receiving the semiconductor body and the cleaning agent, the cleaning station being arranged to bring the semiconductor body in contact with the cleaning agent (col 5, lines 5-15; fig. 2A)

Since the apparatus of Verhaverbeke meets all the structural limitations of claims 14-15, the apparatus taught by Verhaverbeke would be structurally capable of "of" for use

in a method claimed in claim 1" and " for mixing of sulphuric acid between 0.01 and 10% by weight, and preferably between 0.5 and 5% by weight with demineralized water"

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 8-9, 11 rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu et al (US 7,078,351) in view of Basi (US 4,116,714)

Chiu method has been described above. Unlike the instant claimed inventions as per claims 3, 8-9, 11, Chiu fails to disclose using a cleaning solution comprises sulfuric and phosphoric acid, water, repeating the rinsing step 2-4 times after the cleaning step

Basi discloses a semiconductor cleaning process comprises the step of spray cleaning a semiconductor substrate using a cleaning solution comprises sulfuric and phosphoric acid, water, repeating the rinsing step after the cleaning step (col 2, lines 26-46, col 3, lines 15-30)

One skilled in the art at the time the invention was made would have found it obvious to modify Chiu method by using a cleaning solution comprises sulfuric and phosphoric acid, water to effective clean the substrate and to produce haze-free surface as taught by Basi (col 2, lines 30-35). One skilled in the art at the time the invention was made

would also have found it obvious to modify Chiu method by repeating the rinsing step, as taught by Basi, 2-4 times after the cleaning step in order to remove all the chemical residues on the semiconductor substrate

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu et al (US 7,078,351) in view of Uzoh (US 6,235,406)

Chiu method has been described above. Unlike the instant claimed invention as per claim 5, Chiu fails to disclose that the sulfuric acid concentration is between 0.5-5% by weight

Uzoh discloses a method of manufacturing semiconductor device comprises a step of cleaning semiconductor wafer with a solution including sulfuric acid and DI water wherein the concentration of sulfuric acid is between 2-8 % by weight (col 5, lines 35-4O)

One skilled in the art at the time the invention was made would have found it obvious to modify Chiu by cleaning the semiconductor body with a solution including sulfuric acid and DI water wherein the concentration of sulfuric acid is between 2-8 % by weight as per Uzoh since Uzoh discloses that the sulfuric concentration of the cleaning solution is preferably between 2-8 % in DI water (col 5, lines 36-39)

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu et al (US 7,078,351) in view of Mohindra et al (US 6,352,082)

Chiu method has been described above. Unlike the instant claimed invention as per

claim 10, Chiu fails to disclose rinsing the semiconductor body/substrate with hot, 70-75 degree C, demineralized water

Mohindra discloses a method of cleaning semiconductor wafer comprises a step of rinsing the semiconductor wafer with hot, 70-75 degree C, DI water/demineralized water (col 10, lines 15-20, col 19, lines 1-4)

One skilled in the art at the time the invention was made would have found it obvious to modify Chiu method by rinsing the semiconductor body/substrate with hot, 70-75 degree C, DI water as taught by Mohindra to promote drying of the semiconductor wafer

7. Claim 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yun et al (US 6,635,582) in view of Chiu et al (US 7,078,351)

Yun discloses a process for patterning a photoresist on a semiconductor device with a substrate 100 and a semiconductor body which comprises at least one active semiconductor element (112) (col 3, lines 28-36) wherein, after the semiconductor element has been formed, a layered structure is provided comprising at least one electrically insulating layer 114, wherein an opening is formed in the layered structure by means of a patterned photoresist layer (134) and an etch process (col 3, lines 40-45), wherein residues are formed at the surface of the semiconductor body during the etch process (col 1, lines 20-25), wherein the photoresist layer is ashed, after the etch process, by means of a treatment with an oxygen-containing compound (col 3, lines 52-57), a tungsten/metal filled via 120 is formed which is contacted by an aluminum layer/track 122 leaving the tungsten 120 exposed (col 3, lines 30-42; fig. 6), the surface

of the semiconductor device is cleaned with a wet cleaning solution (col 3, lines 55-60)
Unlike the instant claimed inventions as per claims 12-13, Yun fails to disclose using a heated cleaning agent containing a diluted solution of an aqueous acid/acid in water and being heated to a temperature above the room temperature, characterized in that sulphuric acid is chosen for the acid in the cleaning agent (col 7, lines 15-20)
Chiu discloses a process for patterning a photoresist on a semiconductor device comprises a step of cleaning the semiconductor device using a cleaning agent containing a diluted solution of an aqueous acid/acid in water and being heated to a temperature above the room temperature for 5-10 minutes, as a result of which the residues formed are removed from the surface, characterized in that sulphuric acid is chosen for the acid in the cleaning agent (col 7, lines 15-20)
One skilled in the art at the time the invention was made would have found it obvious to modify Yu method by cleaning the semiconductor device using a cleaning agent containing a diluted solution of an aqueous acid/acid in water and being heated to a temperature above the room temperature for 5-10 minutes, as a result of which the residues formed are removed from the surface, characterized in that sulphuric acid is chosen for the acid in the cleaning agent as per Chiu because Chiu discloses that sulfuric acid mixtures are very effective in the residual free removal of highly postbaked resist (col 7, lines 20-25)

Allowable Subject Matter

8. Claims 4, 6 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Regarding claim 4, the cited prior art of record fails to disclose or suggest a method of manufacturing a semiconductor device comprises a limitation of "characterized in that the phosphoric acid concentration is chosen to range between 0.01 and 5% by weight, and preferably between 0.1 and 1% by weight 5, in combination with the rest of the limitations of claim 4. The reasons for the indication of allowable subject matter of claim 6 has been stated in paragraph 1 above

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Bergman (US 2001/0027799) discloses that concentrated sulfuric acid contains water (page 3, pa 0037)

10. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAN VINH whose telephone number is (571)272-1471. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lan Vinh/
Primary Examiner, Art Unit 1792